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ORIGINAL ARTICLE

Combined palatal and buccal flaps in oroantral fistula repair

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KEYWORDS

Oroantral fistula;
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Treatment;
Double flap technique

Abstract *Objective:* To review our 7-year clinical experience with the combined palatal–buccal flaps for delayed repair of oroantral fistula (OAF) and to highlight its advantages, disadvantages, and complications.

Study design: The records of 18 patients with late OAF treated by combined palatal–buccal flaps from 2004 to 2010 were reviewed. Data recorded were patient age and sex, cause of fistula, signs and symptoms, interval from appearance of fistula to repair, fistula size, radiographic appearance, method of repair, and immediate and late complications.

Results: The study included 18 patients with a mean age of 35.5 years. All included patients had a defect size range from 0.3 to 1.3 cm, 16 patients following extraction of the 1st molar and only 2 defects after extraction of the 2nd premolar. Duration till fistula development ranged from 1 month to 7 months. We had only 2 failure cases after using our technique which necessitated 2nd intervention.

Conclusion: The use of combined palatal–buccal flap technique is a simple, convenient, and reliable method for the late repair of small to medium-sized OAF.

1. Introduction

The oroantral communication and fistula (OAF) is a clinical complication which is frequently encountered by oral surgeons. The incidence of this complication varies from 0.31% to 3.8% after simple extraction of the related maxillary teeth.[1]

Oro-antral fistula is an epithelialized communication that develops between the pseudo stratified columnar ciliated epithelium of the maxillary antrum and squamous epithelium of the oral mucosa.[2] When an oroantral fistula develops, the presence of maxillary sinusitis, epithelialization of the fistula tract, osteitis or osteomylitis on the communication's margins, or foreign bodies, will prevent spontaneous healing and result in chronic fistula formation.[3]

Oro-antral fistula (OAF) most commonly occurs as a complication of maxillary molar or premolar extraction. The primary reason is the anatomic proximity of the root apices to the sinus floor or projection of the roots within the maxillary sinus. Other causes of OAF include dentoalveolar infections, destruction of a portion of the sinus by cysts or benign or

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malignant tumors, Paget's disease, trauma, and complication of the Caldwell-Luc procedure.[2]

In the absence of sinus infection, most small acute oroantral communications, 1–2 mm in diameter will heal spontaneously after the formation of a blood clot and secondary healing. However, larger oroantral defects that are not diagnosed or are left untreated rarely heal, and the subsequent formation of an oroantral fistula (OAF) becomes inevitable requiring secondary surgical closure.[3] Immediate closure of acute oroantral defects has a high success rate, approaching 95%, but the success rate of secondary closure of OAFs has been reported to be as low as 67%.[4]

It is unanimously agreed that, regardless of the surgical technique, successful closure of the oroantral fistula must be preceded by the complete elimination of sinus pathology, the fistulous tract, infection and degenerated polypoid mucosa, and diseased bone.[5]

Surgical repair of the oroantral fistula is one of the more challenging problems confronting the surgeon working in the maxillofacial region. The multiple techniques described in the literature over the last 50 years point to the lack of consensus for a uniformly successful procedure.[2] The desirability of providing epithelial covering for both surfaces of such a repair is well known, both to reduce contracture and to lessen the chances of postoperative infection, both of which increase the likelihood of wound breakdown and recurrence of the fistula.[6]

1.1. The aim of the present study

The aim of the present study is to describe our 7-year clinical experience with the combined palatal–buccal flaps (local palatal inversion flap and the buccal advancement flap) for delayed repair of OAF and to highlight its advantages, disadvantages, and complications.

2. Materials and methods

Our study included 18 patients with oroantral fistulae. They presented to the Otolaryngology Department at the Faculty of Medicine, Ain Shams University Hospitals and the Dentistry Department at Ain Shams University Specialized Hospitals in the period between April 2004 and December 2010. All the patients were informed about the study and signed a written informed consent about the nature of the study. The institutional ethics committee approval was obtained before conducting this study.

All the patients in the present study presented with delayed OAF after tooth extraction which fostered the development of acute and chronic maxillary sinusitis and purulent yellow to green discharge from the fistula.

Data recorded included age, sex, medical history and also included fistula location and size, etiology, fistula duration, complication, duration till complete healing and sinus disease. Follow up was performed at 15 days, 1 month, 3 months, 6 months and 12 months after surgery. Demographic data and patients' characteristics are shown in Table 1.

A preoperative systemic evaluation and laboratory investigations were performed for all the included patients. Pre-operative oral hygiene is accomplished using anti septic mouth wash and using either scaling or pocket curettage.

The diagnosis of OAF was made by the nose blowing test and probing (the introduction of a probe into the antrum through the fistula). All patients underwent clinical history taking and clinical examination before surgery. Panoramic view radiographs were taken preoperatively as it gives an accurate estimation of the size of the bony defect of the fistula and the presence or location of dental roots or implants that may have been pushed into the antrum. Also computed tomography on the sinuses was obtained to evaluate the presence of sinusitis. Antral infections were controlled by antibiotics and nasal irrigations. At the time of surgery a functional endoscopic sinus surgery and Middle meatal antrostomy were done in all patients.

2.1. Surgical technique

After using the general anesthesia, the patient is positioned in *Trendelenburg* position. The mouth is opened using the standard mouth gag (Boyle's Davis mouth gag). A fistulectomy was done initially by incising the wound edges of the fistula followed by removal of all diseased bones and smoothening of the bony edge.

This was followed by designing the palatal inversion flap on the basis of the greater palatine vessels after measuring the bone defect by the measure not the soft tissue defect. Once the flap was raised, the residual palatal raw surface was left to heal by secondary intension with the formation of granulation tissue.

The horizontal palatal flap was then inverted so that the oral palatal epithelial surface was covering the bone defect and facing the maxillary sinus. Then it will be covered by the buccal advancement flap that was released by extending the incision into the inside of the cheek from the gingivolabial sulcus in order to have a wide base to ensure a good blood supply.

The mucosal surface of the buccal flap is facing the oral cavity. The combined palatal buccal flaps are kept in position by a single suture that passes from the epithelial surface of the palatal flap out from the raw surface and into the raw surface of the buccal flap out from the mucosal surface and then back again through the reverse route and when suture was tied the flaps are coapted and the knot was facing upwards in the maxillary sinus as shown in Fig. 1.

Suture must be done using absorbable material as Vicryl. The medial edge of the buccal flap was sutured to the edges of the raw surface in the palate formed due to inversion of the palatal flap. This suture line must be well away from the bony defect.

Surgical inspection revealed that, in many cases, the actual bony defect was larger than the soft tissue fistula. The technique is so simple that it has been performed by different surgeons in a very highly successful way. Although the operations were performed by three different surgeons in this study, failure of the procedure was actually seen in only 2 patients.

2.2. Postoperative management

The patients were instructed not to chew or swallow hard food and to drink fluid away from the operative side. Nose

Table 1 Demographic data and characteristics.

No.	Age (y)	Sex	Location	Size (cm)	Duration (M)	Sinus disease	Etiology	Previous management	Result	Systemic disease
1	28	M	1st Molar	0.5	3	Infected	Extraction	No	Closure	No
2	34	M	1st Molar	0.4	7	Infected	Extraction	No	Closure	No
3	31	F	1st Molar	0.5	2	Infected	Extraction	No	Closure	No
4	29	M	1st Molar	0.6	5	Infected	Extraction	No	Closure	No
5	28	F	1st Molar	0.7	4	Infected	Extraction	No	Closure	No
6	44	F	1st Molar	0.3	3	Infected	Extraction	Yes (BFP)	Failure	Diabetes
7	37	M	1st Molar	0.4	4	Infected	Extraction	No	Closure	No
8	39	M	2nd Pre molar	0.5	2	Infected	Extraction	No	Closure	No
9	33	F	1st Molar	1.3	1	Infected	Extraction	No	Closure	No
10	36	M	1st Molar	0.6	2	Infected	Extraction	No	Closure	No
11	39	F	1st Molar	0.5	3	Infected	Extraction	No	Closure	No
12	27	M	1st Molar	0.4	3	Infected	Extraction	No	Closure	No
13	32	M	1st Molar	0.4	6	Infected	Extraction	No	Closure	No
14	41	M	2nd Pre molar	0.5	5	Infected	Extraction	Yes (??)	Failure	No
15	35	F	1st Molar	1.3	4	Infected	Extraction	No	Closure	No
16	30	F	1st Molar	0.5	3	Infected	Extraction	No	Closure	No
17	43	M	1st Molar	0.4	3	Infected	Extraction	Yes (1ry)	Closure	Diabetes
18	39	M	1st Molar	0.4	2	Infected	Extraction	No	Closure	NO

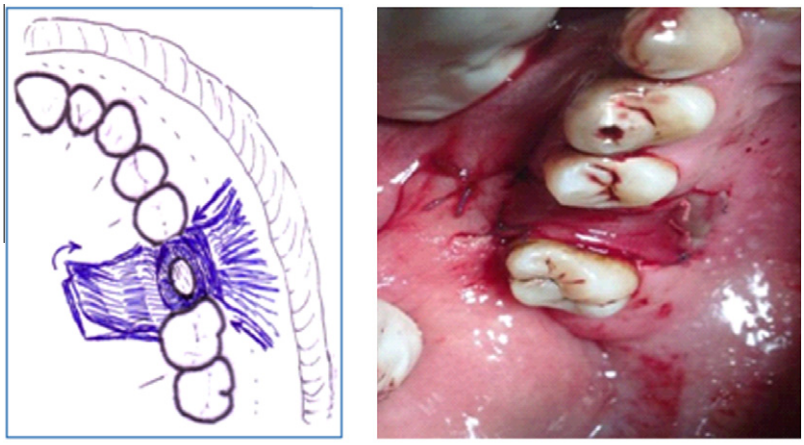


Figure 1 (a) Diagram of the new technique (b) OAF closed by the new technique.

blowing and sneezing with a closed mouth were prohibited for 2 weeks and not to roll the tongue over the suture line or the flap for the 1st week post operation. All our patients received intra-operative and postoperative antimicrobial treatment for 10 days. Non-steroidal anti-inflammatory drugs (NSAIDS) were prescribed for pain control.

Patients were examined every week during the 1st post operative month and then every 2 weeks during the 2nd and 3rd months then every month till 1 year post operatively, see Fig. 2. These patients were examined searching for the recurrence of the fistula or infection and chewing difficulties, healing of the denuded areas of the hard palate.

The criteria for successful repair were complete healing of the flaps without symptoms and signs of leakage or communication between the maxillary sinus and oral cavity.

3. Results

These 18 patients included 11 males and 7 females (Graph 1) with age range from 27 years to 44 years and a mean age of 35.5. Three patients had previous attempts for closure of the fistula at the dentistry department, one of them was primary closure at the time of extraction and another patient had pedicled buccal fat pad while the third patient had unknown trial of closure.

All oro-antral fistulae of the included patients had a defect size ranging from 0.3 to 1.3 cm in diameter with a mean diameter of about 0.54 cm. There were 16 defects after extraction of the 1st molar tooth and only 2 defects after extraction of the 2nd premolar tooth. The interval from fistula development to surgical repair was 1 month to 7 months with a mean interval period of about 3.4 months. There were 2 patients with diabetes

Figure 2 OAF healed after 1 month of surgery by our technique.

mellitus, one of them had a trial of 1ry closure and failed but after our technique it was closed but the other diabetic patient failed to close the fistula after our technique. Two recurrent cases were reported after our surgical technique due to local persistence of infection, one of them had diabetes mellitus (size 0.3 cm) and another one (size 0.5 cm) was not diabetic (Graph 2). The hospital stay ranged from 2 days to 7 days in the post-operative period with a mean period of about 3.5 days.

All patients reported difficulties in swallowing and chewing which was improved after 2 weeks post-operatively. The most annoying post operative symptom was fullness at the gingivo-labial sulcus at the base of the buccal flap which led to difficulty in the movement of the cheek by the patient. Despite that, there was no speech disturbance reported in patients treated by the presented technique.

4. Discussion

The closure of the OAF is one of the most challenging and difficult problems in the field of oral surgery.[7] Numerous modalities are present in the literature which are used for the closure of the OAF including the autogenous grafts, allografts, synthetic materials and the soft tissue flaps including the buccal flaps, palatal flaps and, the distant flaps. Various double-layer closures utilizing local tissues have been described, providing sufficient tissue bulk.[8] These include the combination of inversion and rotational advancement flaps,[9–11] double overlapping hinged flaps,[12] double island flaps,[13] and superimposition of reverse palatal and buccal flaps.[14] But none of these methods have gained wide acceptance.[7] Although none of these methods proved to be superior to others, certain advantages and disadvantages exist among them. The most common methods used for soft tissue repair in cases of OAF are the buccal flap technique and the palatal pedicled flap technique.[3]

Regardless of the chosen technique, there are 2 principles that must be observed. The first is that the sinus must be rendered free of infection with adequate nasal drainage. This may necessitate Caldwell-Luc procedure or endoscopic sinus surgery. The use of appropriate sinus antibiotics in addition to topical and or systemic decongestants is necessary preoperatively. The second is that there must be tension free closure of a broad based, well vascularized soft tissue flap over the intact bone.[2]

One of the most common causes for the development of OAF is tooth extraction. Punwutukorn et al.[1] showed that extraction of the upper 1st molars is the most common etiologic factor for oroantral communications. In our patients, we found that most of the cases were after tooth extraction with the 1st molar tooth is the commonest one involved with the development of the fistula formation.

In our technique we used the reversed palatal flap including the periosteum to be covered by the buccal advancement flap. The results of the present study were similar to those of previous studies.

The advantages of using two flaps over one flap is that it provides epithelial covering to both the superior and inferior surfaces of the repaired defect which will result in reduction in the incidence of contracture and the chances of postoperative infection, both of which increase the likelihood of wound breakdown and persistence of the defect.

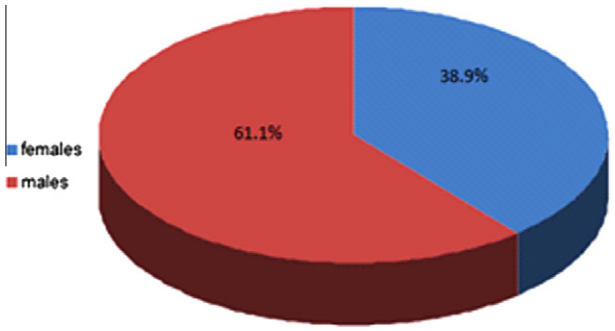
Ziemba,[14] described a two flap technique in the closure of oro-antral fistulae, but the disadvantages of the method described in his work is that epithelium is buried against bone, which is undesirable as it carries a risk of subsequent pathology such as cyst formation originating from the buried epithelium. However, in our case studiess we did not see such complication.

Batra et al.,[15] used a double layer flap closure method to repair the OAF, that is a Buccal Fat Pad (BFP) covering OAC with a layer of buccal mucosal flap over it in 6 cases. They did not find any advantage of covering BFP with buccal flap in combination technique except when BFP is stretched excessively or is perforated. This discordance may be attributed to the small number of cases in their series.

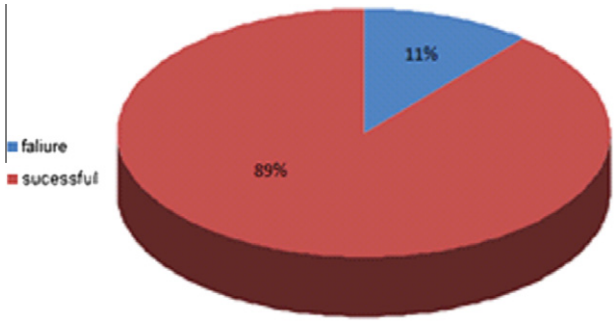
There are certain factors like the size of the fistula, sinus infection, osteitis on the margins of the fistula, epithelialization of the fistulus tract, and systemic disease like diabetes which prevent spontaneous healing. In our study, one of the failure cases was diabetic which might explain the healing failure of that fistula.

Also, regarding sinus infection, Hernando et al.,[7] reported that the most common cause of failure was insufficient control of the sinus pathology. This is why we did endoscopic middle meatal antrostomy in all our study patients.

We assume that our technique is simple, convenient, and reliable. We use Boyle's Davis mouth gag to keep the patients' mouth open during surgery and the tongue blade also helps to keep the tongue away from the surgical field. The advantages of the *Trendelenburg* position are to see better into the fistula by looking down into it and having better dexterity when



Graph 1 Pie chart displaying the percentage of males to females in this study.



Graph 2 Pie chart displaying the percentage of successful cases.

handling the instruments especially the drill. The fixation knot keeps both flaps properly positioned and fixed to each other to ensure better coaptation of the flaps to each other and hence good healing otherwise gaping will occur and failure will result. Multilayered wide release flaps are essential to ensure a good blood supply and better viability of the flaps which will result in good healing.

This double flap technique like all the other techniques has certain advantages and disadvantages. Perfusion of the palatal flap is better, but bony structure of the hard palate is exposed, and re-epithelialization requires from 2 to 3 months, causing severe complains and edema of the hard palate. Despite the easier surgical procedure, perfusion of buccal flaps is poor and narrowing of the gingivobuccal sulcus may occur.

In spite of the high success rate, failure possibility is present and patients should be informed about the need for another trial for closure of the OAF. Finally it should be kept in mind that the immediate closure of the OAF has a high success rate which is significantly higher than for closure of chronic fistulae.

5. Conclusion

The results of this series support the view that the use of combined buccal–palatal flap technique is a simple, convenient, and reliable method for the late repair of small to medium sized OAF. Multiple surgical interventions may be necessary only on rare occasions.

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